

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

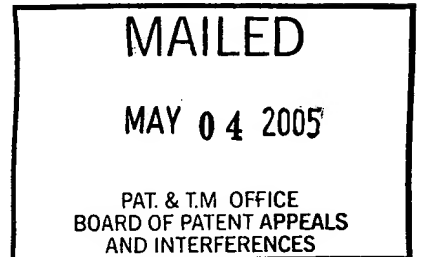
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PANAYOTIS C. ANDRICACOS, STEVEN H. BOETTCHER, FENTON
READ MCFEELY, and MILAN PAUNOVIC

Appeal No. 2005-0155
Application No. 09/760,884

ON BRIEF



Before PAK, WALTZ, and TIMM, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the examiner's refusal to allow claims 10 through 22, 29 and 30 which are all of the claims pending in the present application.

APPEALED SUBJECT MATTER

According to appellants (the Brief, page 4 and the Reply Brief, page 4), "[c]laims 10-23 [sic., 10-22] and 29-30 stand or

fall together."¹ Therefore, for purposes of this appeal, we select claim 10 from all the claims on appeal and decide the examiner's rejection based on this claim alone consistent with 37 CFR § 1.192(c)(7)(2003) and 37 CFR § 41.37(c)(1)(vii)(2004).

Claim 10 is reproduced below:

10. A method of fabricating an electronic structure which comprises forming an insulating material on a substrate;

lithographically defining and forming recesses for lines and/or via having sidewalls and bottom surface in the insulating material in which interconnection conductor material will be deposited;

depositing a barrier layer on sidewalls and bottom surfaces of the recesses;

providing an electroplating bath comprising:

a source of cupric ions,

a complexing agent,

cyanide ions,

a stabilizing agent,

and a pH of at least 12.89;

providing an electrical current sufficient to provide a current density of from about 5 to about 25 milliamps/cm²; and

electroplating copper directly on said barrier layer.

¹See the Advisory Action mailed March 19, 2004.

Appeal No. 2005-0155
Application No. 09/760,884

THE PRIOR ART REFERENCES

The examiner relies on the following prior art references:

Ting et al. (Ting)	5,969,422	Oct. 19, 1999
Landau	6,261,433 B1	Jul. 17, 2001
		(Filed Apr. 21, 1999)
Chen	WO 99/47731	Sep. 23, 1999
(Published World Intell. Prop. Org. Patent Application)		

THE REJECTION

Claims 10 through 22, 29 and 30 stand rejected under 35 U.S.C. § 103 as unpatentable over the combined disclosures of Chen, Landau, and Ting.

OPINION

We have carefully reviewed the claims, specification, and applied prior art, including all of the arguments advanced by both the examiner and the appellants in support of their respective positions. This review has led us to conclude that the examiner's Section 103 rejection is well founded. Accordingly, we will sustain the examiner's Section 103 rejection for essentially those factual findings and conclusions set forth in the Answer. We add the following primarily for emphasis and completeness.

The examiner finds (Answer, page 4) that Chen

discloses a method for fabricating electronic structures wherein a barrier layer 10 is formed on the bottom and side walls trenches 5 or vias of an insulating layer 8 (fig. 2A; page 12 to page 13). The electronic structure may include a semiconductor (substrate) covered with the insulating material (page 2). Copper is electroplated directly onto the barrier layer 10 (page 12, line 5). In an example depicting the enhancement of a thin seed layer, Figures 2B and 2C illustrate copper 18 being electroplated directly on the barrier layer 10 on the bottom and side walls in discontinuities present within a thin seed layer 15 (see fig. 2B and 2C). The electroplating bath is comprised of copper sulfate, as a source of cupric ions, and a completing agent and may also contain other additives (page 16). The bath is maintained at a pH of at least 9.0 and can have a pH of 5-13 (page 17). The current density used for electroplating "can be 1 to 5 milliamps/cm²", which contains the endpoint of the claimed range (page 18).

The examiner acknowledges that Chen is silent as to how the trenches or vias are formed on its insulating material coated substrate and that Chen does not mention an electroplating bath containing cyanide ions and a stabilizing agent. See the Answer, page 5.

To remedy the above deficiencies, the examiner relies on the disclosures of Landau and Ting. See the Answer, pages 6-7. The examiner correctly finds that Landau teaches advantages of employing lithographic techniques for making trenches or vias on an insulating layer of the substrate of the type described in Chen in a similar method. See the Answer, page 6. The examiner

also correctly finds that Ting teaches the advantages of employing stabilizers, including those containing cyanide ions, in the electroplating bath of the type described in Chan in a similar method. See the Answer, page 7.

Based on the above teachings, the examiner determines that one of ordinary skill in the art would have been led to employ the lithographic techniques taught by Landau for making trenches or vias described in Chen and employ the stabilizers taught by Ting as part of the electroplating bath described in Chen, motivated by a reasonable expectation of obtaining the advantages taught by Landau and Ting. See the Answer, pages 6-7.

The appellants do not specifically challenge the examiner's determination that one of ordinary skill in the art would have been led to employ the lithographic techniques taught by Landau and the stabilizers taught by Ting in the electronic structure fabricating method described in Chen. See the Brief and the Reply Brief in their entirety. Rather, the appellants specifically argue that Chen, Landau, and Ting teach away from electroplating copper **directly** onto the barrier layer. See the Brief and the Reply Brief in their entirety. We are not persuaded by this argument.

As found by the examiner (Answer, pages 9-10), Chen teaches that copper can be directly electroplated onto the barrier layer or can be electroplated onto a seed layer or can be electroplated onto an ultra-thin copper seed layer covering the barrier layer. See also Chen, the abstract and page 12. Indeed, we note that the appellants acknowledge at page 6 of the Brief that "[t]he Chen abstract apparently supports the Examiner by reciting: 'electroplate copper directly onto a barrier layer material.'" Consistent with Chen's teaching, Landau and Ting also teach electroplating copper directly onto a barrier layer formed by a seed layer. As found by the examiner (Answer, pages 10-11), "Ting . . . clearly teach[es], 'The seed layer also functions as a barrier/adhesion layer for the subsequently plated Cu or Cu-base alloy' (see page 4 of Appellant's [sic] Brief and . . . [Ting] at col. 6, lines 41-47 and Abstract)." The fact that Chen teaches a preference for electroplating copper after an ultra-thin copper seed layer is deposited onto the barrier layer does not negate Chen's additional teaching that copper can be directly electroplated onto the barrier layer. See the abstract and pages 12-14. Thus, substantial evidence supports the examiner's determination that one of ordinary skill in the art would have employed any one of the three conventional electroplating

techniques discussed in Chen, including electroplating copper directly onto the barrier layer, in the electronic structure fabricating method described in Chen. *Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807, 10 USPQ2d 1843, 1846 (Fed. Cir. 1989) ("the fact that a specific [embodiment] is taught to be preferred is not controlling, since all disclosures or the prior art, including unpreferred embodiments, must be considered") (quoting *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976); *In re Boe*, 355 F.2d 961, 965, 148 USPQ 507, 510 (CCPA 1966) (all of the disclosures in a reference, including non-preferred embodiments, "must be evaluated for what they fairly teach one of ordinary skill in the art").

Under the circumstances recounted above, we determine that the examiner has established a *prima facie* case of obviousness which has not been sufficiently rebutted by the appellants. Thus, we concur with the examiner that the evidence of obviousness, on balance, outweighs the evidence of non-obviousness proffered by the appellants.

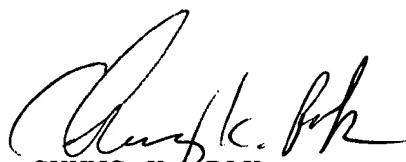
Appeal No. 2005-0155
Application No. 09/760,884

CONCLUSION

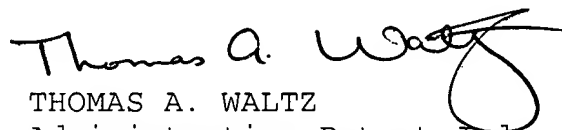
In view of the foregoing, we affirm the examiner's decision rejecting claims 10 through 22, 29 and 30 under 35 U.S.C. § 103, as unpatentable over the combined disclosures of Chen, Landau, and Ting.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED



CHUNG K. PAK)
Administrative Patent Judge)



THOMAS A. WALTZ)
Administrative Patent Judge)



CATHERINE TIMM)
Administrative Patent Judge)

BOARD OF PATENT
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Appeal No. 2005-0155
Application No. 09/760,884

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